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(21) International Application Number: PCT/EP95/01483 (22) International Filing Date: 19 April 1995 (19.04.95) (30) Priority Data: P 44 14 238.2 23 April 1994 (23.04.94) DE (71) Applicant (for all designated States except US): THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 452102 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): REINHEIMER, Horst [DE/DE]; Imkerweg 21, D-90562 Heroldsberg (DE). REHDERS, Frank [DE/DE]; Kersbachstrasse 13, D-9:361 Pinzberg (DE). (74) Agents: RAU, Manfred et al.; Königstrasse 2, D-90402 Nürnberg (DE).		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i>
(54) Title: HOUSEHOLD PAPER OR PAPER FOR HYGIENE AND PROCESS FOR INCREASING ITS SOFTNESS AND REDUCING ITS VOLUME WHEN PACKED (57) Abstract A household paper or paper for hygiene (toilet paper 1) consists of at least one, preferably two to four, layers (2, 3, 4) of tissue paper, wherein the paper is provided with an embossment (5, 5') in particular for adhesion of the layers. The paper (toilet paper 1) is after-calendered subsequent to its embossment and optional adhesion of the layers.		

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HOUSEHOLD PAPER OR PAPER FOR HYGIENE AND PROCESS FOR INCREASING
ITS SOFTNESS AND REDUCING ITS VOLUME WHEN PACKED

The invention relates to a household paper or paper for hygiene according to the preamble of Claim 1 and to a process for increasing the softness and reducing the volume of such papers when packed.

It is known to produce household or hygiene papers from at least one, preferably two to four layers of tissue paper, the product being provided with an embossment. In the case of single- and multi-layered papers, this embossment necessitates surface texturing which makes the paper pleasantly soft. In the case of a multi-layered household or hygiene paper, the embossment also serves to stick the individual layers of tissue paper together. An example of such a household or hygiene paper and its production is given in DE 39 42 536 C2.

The properties for use of household or hygiene papers have to meet various requirements. For example, hygiene papers such as toilet paper, handkerchiefs or cosmetic cloths on the one hand have to be as soft as possible but on the other hand have to have a certain degree of strength. For economic and ecological reasons, which are becoming increasingly important nowadays, consumer goods in general and consequently also household or hygiene papers generally have to be packable as compactly as possible to save packaging material as well as transportation, storage and shelf space in the places of sale. The saving in packaging material also allows disposal costs imposed on manufacturers of such papers owing to the laws governing waste management (keyword: "green point") to be reduced.

On the basis of the problems posed, the object of the invention is to provide a household or hygiene paper in such a way that it has a smaller packed volume with increased softness and virtually unchanged strength. In terms of the process, the softness of

household or hygiene paper is to be increased and its packed volume to be reduced by the invention.

This object is achieved by the features mentioned in the characterising part of claim 1 or claim 3. It has been found that owing to the indicated after-calendering of the paper after the embossment thereof and optionally sticking of layers with practically insignificant losses of strength, on the one hand a clear increase in softness and, on the other hand, a clear reduction in the thickness of the paper can be achieved. The jump in softness is manifested in that a toilet paper of average softness produced in the conventional way acquires softness corresponding to that of a cosmetic cloth merely due to the after-calendering. With regard to the reduction in volume, the roll volume, for example, of toilet paper can be reduced by up to 50% with the same number of sheets and therefore same length of paper, owing to moderate calendering. This means that up to twice as much toilet paper can be placed in a large packing with the same roll and therefore packing volume.

Claims 2 and 4 give advantageous ranges of values for the linear pressure of the calendering rollers. Such linear pressure values can already be achieved owing to the inherent weight of conventional calendering rollers. To achieve the higher linear pressure values within the specified range, it is sufficient to load the calendering rollers with pressure cylinders having a moderate cylinder pressure below 1 bar.

Further features, details and advantages of the invention can be inferred from the following description in which an embodiment is described in detail with reference to the accompanying drawing.

The drawing shows schematically the construction of a toilet paper according to the invention and the after-calendering thereof.

As shown in the drawing, a toilet paper 1 according to the invention consists of three layers 2, 3, 4 of tissue paper having a weight per unit area of about 15 g/m^2 . The upper layer 2 on the one hand and the two lower layers 3, 4 on the other hand are each provided with mound-like embossments 5, 5' which each extend concavely inwardly from the upper side 6 and lower side 7 of the paper. Adhesion between the layers 3, 4 on the one hand and the layer 2 on the other hand is achieved at the peaks 8 of the embossment 5' of the underside of the paper 7 owing to the embossing pressure.

The mutual offset of the mound-like embossments 5, 5' in the layers 2 or 3 and 4 do not produce roughening mounds from the upper side 6 or underside 7 of the paper, so such a toilet paper 1 is already relatively soft. As also shown in the enlarged detail in the accompanying drawing, a traditionally produced toilet paper 1 of this type has a relatively great thickness owing to the bulking by the embossments 5, 5'.

It is accordingly proposed according to the invention that a toilet paper 1 produced traditionally up to this production stage be passed through a pair of calendering rollers 9 with an upper pressing roller 10 and a lower opposing roller 11 in order to subject it to after-calendering. The pair of calendering rollers 9 is completely conventional in construction and therefore requires no further explanation. It should merely be mentioned that the pressing roller 10 operates under the load of its inherent weight or is loaded against the opposing roller 11 by the two pressure cylinders 12, 13 with relatively low cylinder pressures p of less than 1 bar. The linear pressure values attainable are therefore in the range of 10 to 30 N/cm approx.

The strength of the toilet paper 1 is virtually unaffected by this after-calendering, but its softness is increased and its thickness so considerably reduced that considerably more sheets of toilet paper 15 pass onto a roll of toilet paper 14 of unchanged standard diameter D .

The following table quantitatively demonstrates these qualitative statements. The measurements were taken on conventional commercial toilet paper produced by the applicants. The toilet paper products "BESS Perfect" (2-layered), "BESS Exclusiv" (3-layered) and "BESS First Class" (4-layered) were used. These toilet papers were investigated without calendering and subsequent to after-calendering with a linear pressure of about 20 N/cm. The breaking strength was measured dry in the longitudinal and transverse direction of the machine and the relationship between number of sheets and diameter when the toilet paper was wound onto conventional rollers was measured with comparable winding tensions. The softness was evaluated by a conventional panel test.

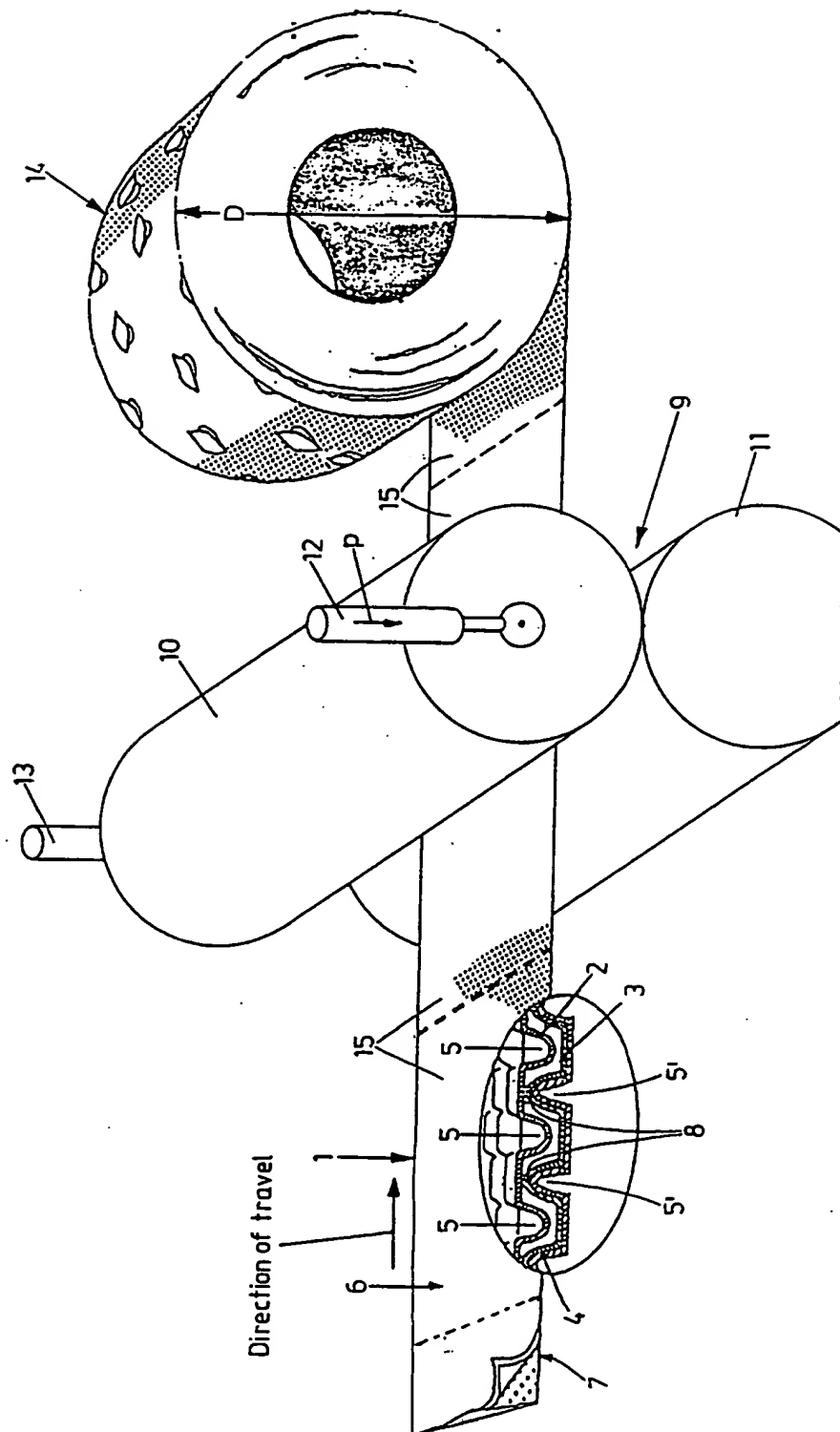
The measurements led to the results compiled in the following table.

Table: Comparison between uncalendered and after-calendered toilet papers

Parameters	2-layered		3-layered		4-layered	
	uncal.	after-cal.	uncal.	after-cal.	uncal.	after-cal.
Breaking strength (dry)						
Longitudinal (N/50 mm)	16.7	17.0	18.6	17.6	21.6	21.1
Transverse (N/50 mm)	5.3	5.0	6.4	5.7	7.7	7.1
Softness	3.0	3.9	3.0	4.2	2.8	4.1
No. of sheets	250	347	200	380	152	261
Roll diameter (mm)	105	109	130	120	125	121

CLAIMS

1. Household paper or paper for hygiene, in particular toilet paper, kitchen cloths or the like, consisting of at least one, preferably two to four, layers (2, 3, 4) of tissue paper, wherein the paper is provided with an embossment (5, 5'), in particular for adhesion of the layers, characterised in that the household paper or paper for hygiene (toilet paper 1) is after-calendered subsequent to its embossment and optionally adhesion of layers.
2. Household paper or paper for hygiene, according to Claim 1, characterised in that the paper (toilet paper 1) is after-calendered with a linear pressure of about 10 to 30 N/cm.
3. Process for increasing the softness and reducing the packed volume of household papers or papers for hygiene, in particular toilet paper (1) kitchen cloths or the like, consisting of at least one, preferably two to four layers (2, 3, 4) of tissue paper, wherein the paper is provided with an embossment (5, 5'), in particular for adhesion of the layers, characterised in that the paper (toilet paper 1) is after-calendered subsequent to its embossment and optionally adhesion of the layers.
4. Process according to Claim 3, characterised in that the household paper or paper for hygiene (toilet paper 1) is after-calendered with a linear pressure of 10 to 30 N/cm.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION - SUBJECT MATTER
IPC 6 D21H25/00 D21H27/40 B31F1/07

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D21H B31F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US-A-3 414 459 (WELLS EDWARD RONALD) 3 December 1968 see the whole document ----	1-4
X	GB-A-1 211 602 (THE PROCTER & GAMBLE COMPANY) 11 November 1970 see the whole document ----	1-4
A	EP-A-0 408 248 (JAMES RIVER CORP) 16 January 1991 see the whole document ----	1-4
A	EP-A-0 436 170 (WALDHOF ASCHAFFENBURG PAPIER) 10 July 1991 see the whole document & DE-A-39 42 536 cited in the application -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-3414459	03-12-68	NONE	
GB-A-1211602	11-11-70	NONE	
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